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(71) Applicant(s)

Margaret Easton Clark
Clark Services, 29 Fir Grove, Craigshill, LIVINGSTON,
West Lothian, EH54 5JP, United Kingdom

(72) Inventor(s)

Margaret Easton Clark

(74) Agent and/or Address for Service

Fitzpatrick's
4 West Regent Street, GLASGOW, G2 1RS,
United Kingdom

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(54) Method of treating waste material

(57) A method of treating waste materials such as farm waste or canal silts comprises preparing means to contain liquid waste such as a bed, trench or container, filling the means with the liquid waste and allowing the waste to settle into a liquid and solid phase. The liquid phase is then removed by either a mechanical means, such as a pump, or by allowing the liquid to be evaporated by the sun or to seep from a permeable holding means. The remaining waste material, with a liquid content of greater than 30%, may then be returned to the land in the form of fertiliser or mulch. A further filtration step may be used to reduce the liquid content of the dewatered slurry utilising a belt filter press and the resulting waste material may be further dried and stored for subsequent use.

An apparatus for effecting the separation of waste materials is also disclosed and comprises a container 1, with inlet pipe 3 and outlet pipe 8, separated into two compartments by a baffle 11, and provided with a means 13 to break-up solid matter.

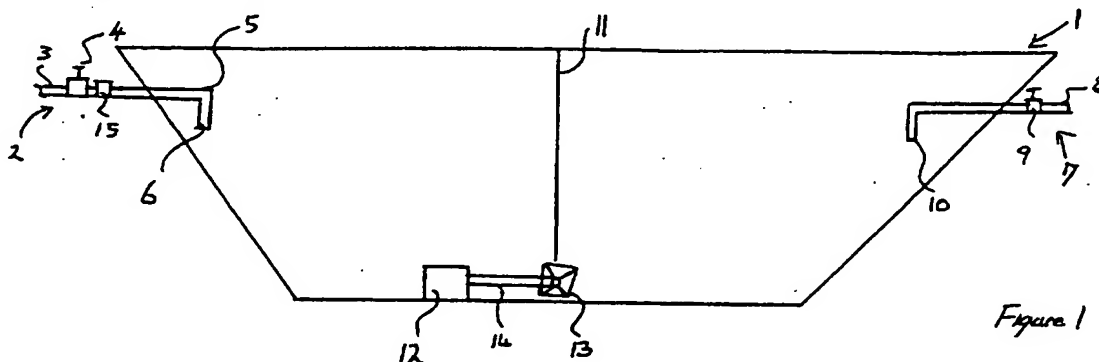


Figure 1

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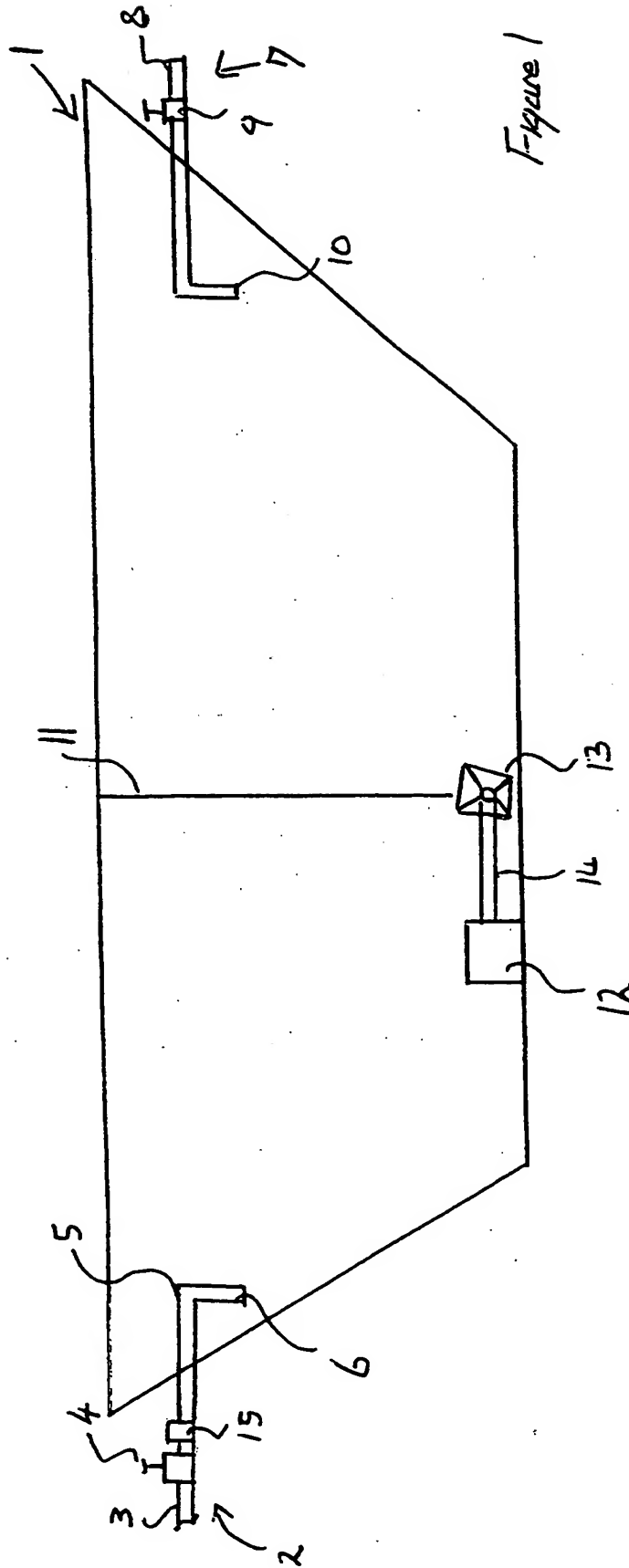


Figure 1

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APPARATUS FOR AND A METHOD
OF TREATING WASTE MATERIALS

This invention relates to apparatus for, and a method
5 of treating waste material, in particular to apparatus and a
method of treating liquid or liquefied waste material which
enables their spreading and use in ancillary industries.

Almost since farming began the waste material from
10 farmyard animals, both liquid and solid, has been used in
the preparation of the land on arable farms. This is
carried out by the spreading of the solid waste from a
machine which chops the material up to more manageable sizes
and then spreads it or by the spraying of the liquid waste.
15 However, when it comes to the reusing of and utilising of
the waste generated by our society this is about as far as
it goes, and you could say we have adopted a rather backward
position in this regard. This might be due to the bad press
received for landfill projects and the problems with regard
20 to methane gas build up and the unauthorised dumping of
toxic waste in these sites.

The present invention is concerned with providing
apparatus and a method for treating waste materials and
25 particularly slurries or slurrified wastes in preparation
for the return of such to the land. The present invention
has been primarily developed for the treatment of liquefied
wastes such as those which originate from the dredging of
canals and estuaries which wastes can contain a relatively

high level of organic life the breakdown of which can be utilised in fertilising and preparing land for crops.

In accordance with a first aspect of the present invention, a method of treating waste material which includes

preparing means to hold liquid material;

filling the means to hold liquid material with liquid or liquefied waste material or passing the liquid or liquefied waste material therethrough;

separating the liquid waste material so that the solids content thereof concentrates and a part of the liquid phase settles to the top;

removing the separated liquid phase from the means to hold liquid material but maintaining the liquid content above 30%; and

returning the waste material to the land.

In one arrangement of the present invention the means to hold liquid material is a filter means, most preferably a filter press, such as a filter belt press.

In a particular arrangement of the present invention a method of treating waste materials includes:

preparing means to hold liquid material;

filling the means to hold liquid material to a predetermined depth with liquid or liquefied waste material;

allowing the liquid waste material to settle so that the solid content thereof separates from the liquid phase;

removing the separated liquid phase from the means to hold liquid material but maintaining the liquid content above 30%; and

returning the waste material to the land.

5

Preferably the liquid phase of the waste material is, or is substantially, water.

In a preferred embodiment of the present invention the means to hold liquid material is a bed or trench which is prepared and into which the liquid or liquefied waste material is placed.

In the case where the means to hold liquid material is a trench which has been cut into the ground this can simply be left open so that seepage from the liquid waste material in the trench will occur. However as the liquid phase of the waste material is commonly water or water based this should cause little or no problem.

20

In one embodiment of this aspect of the present invention the removing of the liquid phase is achieved by natural seepage of the liquid phase from the trench and/or evaporation under the sun. Alternatively the liquid phase may be pumped or otherwise mechanically removed.

25

In certain circumstances for example where you are working in sensitive areas or the liquid or liquefied waste material is of questionable quality this may not be a

desirable thing to do. Consequently, in one embodiment of the present invention a plastic liner, for example a 1000th gauge polyethylene liner, is provided to prevent or arrest any leakage, or to make a preferential path for such leakage to a desired area.

The use of the trench provides a simple and relative cheap means to enable the liquid or liquefied waste to be allowed to settle and the solids therein concentrate in a part of the liquid phase. Once the concentration of the solids has reached a desirable level with the excess liquid being that fraction that is removed the waste material is in a suitable condition for returning to the land.

In the case where the means to hold the liquid or liquefied waste material is a bed preferably the method also includes after the removing of the liquid phase and prior to the returning of the waste material to the land a further drying stage where the liquid content of the waste material is substantially removed and the waste material may be termed as dried. With this type of method the waste material may be returned to the land by ploughing, harrowing, rotavating or otherwise cultivating the land and so mixing the waste material into the top layers of the soil.

In one particular example of the use of a bed the bed is cleared of any undergrowth and an area is prepared with walls having a height of 0.3m. The area within the walls is

the bed and this is filled with liquid or liquefied waste material to a depth of around 0.1m and then allowed to dry under the sun. In other words the sun in conjunction with the natural seepage into the surrounding land is used to remove the liquid phase of the waste material both in the removing of the liquid phase and if appropriate in the further drying phase. The dry waste material can then be returned to the soil by simple tilling or cultivating of the soil.

10

Alternatively the means to hold the liquid material may be a container or containers such as skip containers or the hold of a ship or barge such as a pontoon barge. The use of containers in this way enables the recovery of waste material from urban or built up areas and the reuse of the waste material in the countryside.

15

20

It should be noted that the use of the container only alters one of the operational factors in the working of the invention it does not materially alter the invention. Therefore, basically the operational characteristics of the invention are the same just as if the invention was being used in the countryside.

25

Preferably where the waste material is still in the form of a fluid such as a liquid it is returned to the land by spraying or spreading of the waste material over the land. Once the waste material has been sprayed or spread the land may be ploughed or rotavated so as to enhance the

return.

If so desired the waste material may be dried to a solid and then ground into a powder like material which can be placed in storage for subsequent usage. If so desired the solid waste material may reliquefied prior to be returned to the land.

The present invention is specifically aimed towards freeing material so as to enable the return of the material to the land. However it should always be remembered that the invention is aimed at the return of material which is acceptable to the land's eco system and materials which are perfectly acceptable for use in farming type environments. Consequently it is strongly suggested that the present invention should only be used with acceptable testing of the waste material and where required clearance to determine whether it is fit to be returned to the land.

There are many sets of circumstances which make the use of the method of the present invention a far better alternative to the methods currently being used. The advantages associated with the use of the present invention include:

recycling of waste material so avoiding the need to provide a dump site for material which can be used perfectly safely, plus the ability where required to solidify the waste material for later use or destruction;

localised operation with little or no requirement for

HGV support;

quick and effective separation of the waste materials;

low cost extraction with nature being allowed to take
it's course; and

5 suitable for use in built up areas with a minimum of
fuss.

In accordance with a second aspect of the present
invention there is provided apparatus for use in the
10 treating of waste materials, which apparatus includes a
liquid holding means having inlet flow means, outlet flow
means, a divider to divide the liquid storage means into two
sections but which allows flow of waste material between the
two sections and means to break up any solid matter in the
15 waste material.

In a preferred embodiment of the present invention the
divider is a plate which extends downwards so as to enable
the flow of waste material at the bottom of the liquid
20 holding means. In this way the divider acts to define a
space through which the waste material must flow to get from
the inlet side of the apparatus to the outlet side of the
apparatus, and preferably in this space is located the means
to break up any solid matter in the waste material.

25

Any suitable means to break up the solid matter may be
used, however it is envisaged that the means is a flail type
device which rotates within the space and acts down on any
solid matter in the waste material.

In one embodiment of this aspect of the present invention liquid holding means is a skip container which is provided with inlet pipes and outlet pipes.

5 The present invention, both method and apparatus, may be used in the treatment of many forms of waste materials from any number of origins. However the invention is particularly suited to the treatment of waste materials which to a degree are already in a liquid or liquefied state
10 such as in the treatment and separation of silt from canals and estuaries.

 The present invention will now be described by way of example with reference to the accompanying drawing, in
15 which:

 Figure 1 shows one form of apparatus for use with the present invention.

20 Figure 1 of the drawing shows apparatus in accordance with the present invention. The apparatus is in the basic form of a skip container 1 which is 1.76m high has a base length of 2.6m with an upper length of 3.2m and a width of 1.8m.

25

 The container 1 is provided with:

 inlet flow arrangement 2 which comprises a 0.15m pipe 3 in which is situated a hand controlled valve 4, a right angled bend 5 and a dump tube 6;

outlet flow arrangement 7 which comprises a 0.15m
outflow pipe 8 including therein a hand controlled valve 9
and a take up tube 10;

a divider means 11;

5 an electric motor 12; and
rotatable flail means 13.

The divider means 11 comprises a metal plate which is
welded to the sides of the skip container 1 so as to be
10 substantially flush with the top surfaces of the skip
container and define a space with the base of the container
through which liquid material must pass in passing from
inlet to outlet of the container.

15 It is in this space that the rotatable flail means 13
is located, and this is sized so as to substantially fill
the space between the divider means 11 and the base of the
container 1. The rotatable flail means 13 is connected by a
drive belt 14 to the drive shaft of the electric motor 12,
20 which motor 12 may be located in the skip container.

The inlet and outlet flow arrangements 2 and 7 are
provided in the same side of the skip container 2 but at
opposing ends thereof and on opposite sides of the divider
25 means 11. Each of the flow arrangements are provided near
to the top of the skip container.

A T valve 15 may also be provided in the inlet flow
arrangement 2.

As alternatives the electric motor 12 may be replaced with a fixed engine and the belt drive may be a chain belt drive.

5 In use the waste material including any solid matter such as reeds or the like is fed into the skip container 1 via the inlet flow means 2, and keyed to this the electric motor 12 is activated and the drive belt 14 transmits the drive to the rotatable flail means 13 causing this to rotate
10 and churn up the waste material in the skip container 1. This in turn breaks down the solid matter, such as reeds and grasses, contained in the waste material being fed into the skip container 1 making it more manageable and reducing the risk of the outlet from the skip container being blocked due
15 to the presence of the solid matter.

 The skip container thus fills up with waste material, until the take up tube 10 is submerged whereupon the waste material in the skip container is pumped from the container
20 for subsequent treatment prior to being return to the land.

 In a first method in accordance with the present invention the waste material to be treated is silt extracted from the basin of a canal. In this case the canal is
25 divided into small sections which can be dammed off so that operations will take place in a progressive movement up the canal.

Prior to any operation being started a sample of the

water in the canal and the canal bottom silt is taken and analysed to ensure that it meets the requirements for returning to the land and where necessary an approval is sought from the necessary authorities.

5

Once approval has been obtained a section of the canal is dammed off and the water therein is pumped away to leave a reduced level which contains a majority, if not all, of the canal bottom silt.

10

Simultaneously, a 2m wide trench is dug in the land adjacent to the dammed off section of the canal, but far enough away to ensure there is no chance of any collapse which may hinder operations. The excavated material from the trench is used to form a retaining bun and if required a liner of, for example 1000th gauge polyethylene is installed between the trench and the bun to create a barrier for the waste material.

20

The canal bottom is now searched to remove large waste objects such as tyres, prams and bicycle frames as well as any large boulders which may hinder operations.

25

Once this is complete a suitable 360 degree excavating machine such as, for example, a Caterpillar 320 Long Reach excavator is deployed parallel to the canal bank and the excavation of the canal bottom silt commences with discharge of the excavated material into the trench.

The waste material so excavated is allowed to settle in the trench and the surface water formed in the settlement is pumped back. A second sample is now taken and the silt tested to ensure that it meets requirements and if necessary clearance from the local authorities is obtain to ensure that the waste material is suitable for return to the land.

The water material may be returned to the land in liquid state by spreading over suitable arable land from standard farm spreading equipment.

In one arrangement an electrical control valve connected to a pump is used to control the loading of the waste material for spreading.

15

With regard to a second method in accordance with the present invention again for the treatment of canal bottom silt a skip container as described above with reference to Figure 1 is utilised. In addition a submersible agitating sludge pump such as a Sykes 6in submersible agitating sludge pump is used with a pressure filter such as a Parnaby mobile multi-roll filter belt press and recycling equipment. This method can also be used for contaminated silt and water.

20

The filter press is installed preferably close to a main road and the sludge pump is installed at the excavation site with the skip container. Temporary slurry lines are installed which connect the canal to the inlet of the submersible agitating sludge pump, the outlet of the sludge

pump to the inlet of the skip container, the outlet of the skip container to the filter belt press.

5 The output from the filter belt press is in two forms and these are a concentrated sludge and a liquid (water) filtrate phase. The filtrate phase is returned to the canal or held in storage tanks for subsequent return to the canal. The concentrated sludge may be either a highly concentrated liquid or a semi solid which is passed to tankers for
10 transport to a site where it can be used or for storage to await use.

As with the first method the canal is tested prior to work commencing and approval sought from the appropriate
15 authorities. The canal is again divided into sections and once approval has been obtained a section is dammed off. The water in the dammed off section of the canal is pumped to a reduced level, approximately 0.6m above the general silt level.

20

A suitable 360 degree excavating machine such as, for example, a Caterpillar 320 is again used. However in this method the excavator is deployed into the dammed off section of the canal using a ramp, where it is used to stir and mix
25 the silt on the bottom of the canal with the water remaining in the canal. The slurry line connected to the inlet side of the sludge pump is deployed from the excavator and starting from the remote side of the dammed of section the mixed water and silt is pumped into the skip container where

the solid matter is broken up by the rotatable flail.

If necessary water may be added via the T valve in the inlet flow arrangement of the skip container whilst the waste material is in the skip container to bring the water content of the mixture up to around 60%. This liquid waste material is now pumped to the filter belt press where it is separated into a liquid (water) phase and a concentrated waste phase.

As mentioned above the filter press being used in this example is a Parnaby Multi Roll Filter Belt Press and in this particular form of filter press the waste material goes through three distinct filtration stages and these are:

1) natural drainage in which the excess liquid phase in this case water is allowed to flow away naturally, however the silt etc. in the waste material is prevented from so doing;

2) low pressure filtration in which by the use of two belt arrangements the waste material is subjected to a light squeezing pressure which forces some more of the water from the waste material; and

3) high pressure filtration using rollers in which the two belts are squeezed together by the action of passing around the rollers so that the waste material therebetween is subjected to a high pressure which extracts further liquid (water) from the waste material.

As a result of the action of the filter press the waste

material has been separated into two distinct phases a filtrate liquid phase which while not purified has had a majority of its previous solids content removed, and a concentrated waste material phase.

5

The filtrate phase can be normally returned to the canal without any treatment, however if it is desired that the filtrate be further treated it can be easily passed at this stage downline for such treatment. The filtrate can now be pumped back into the canal so that it forms part of the dammed up water.

The concentrated waste material will be in the form of a concentrated sludge the quality and texture of which will be dependent on the silt which forms a primary part thereof. The sludge can normally be returned to the land at this stage, however if so required may be passed downline for subsequent treatment.

This method is suited towards use in urban environments or situation where space is at a premium and therefore in this case the sludge is tankered away for subsequent treatments such as drying to a powder or storage or direct return to the land. In any event it will finally be returned to the land.

It should be noted that either of the above methods can be used and the waste material loaded into a container such as the hold of a pontoon barge to enable settling or for

removal from the area and use elsewhere

5 In a fourth method in accordance with the present invention a bed is prepared for the treatment of liquid waste material. These beds are basically large lagoons.

10 The method about to be described is suited for the reclaiming of old bings and in this case the area will normally have good natural drainage characteristics which will allow for quick run off liquid from the waste material.

15 The beds are prepared from an area of land which could be in a bing or alternatively may be beside a canal or on farming land. In any event the land is initially cleared of undergrowth and the area so cleared divided into individual beds by the construction of walls having a depth of approximately 0.3m. The walls can be constructed from earth which may be generated by excavating of the beds.

20 The individual beds may be prepared either close to the area from which the extraction is to occur or remote from the extraction without affecting the operation of the method.

25 In one particular arrangement the liquid waste material is to be extracted from a waterway such as the mouth of an estuary of a river.

In this case the first point of operation is the

clearance of reeds etc from the vicinity of the area to be dredged. This may be done in accordance with the normal National Rivers Authority guidelines and the reeds etc so cut are taken away for disposal. The cut material along with the undergrowth removed in preparing the beds may be used to form a mulch which can be recirculated into the land keeping in line with the principles of the current invention.

10 The dredging operation can now begin and the extracted material is loaded into containers or barges for treatment remote from the dredging site. In the dredging operation a pontoon barge fitted with a Hiab (RTM of Hiab Aktiebolag) type back actor boom with a submersible agitator pump
15 mounted thereon can be used.

 In treatment the waste material is loaded into a riddle hopper conveyor unit, for example a 50mm riddle hopper conveyor unit, where it is conveyed to a 15mm size riddle
20 hopper conveyor unit and subsequently to tank transports.

 In one arrangement it is envisaged that the conveyor belt is made from a corded nylon rubber material which is provided with tractor like lugs to assist with the transport
25 of the wet waste material and that the hoppers are generally cone shaped being for example 3m square at the top and 1m square at the bottom and one side of the hopper should be retained with hinges and self locking latches with a riddle of appropriate size being secured in the flow path of the

waste material. The hinged side and the latches enable the hopper side to be lowered and in the case of a blockage enable removal of the blockage, the hopper side can then be locked back up into position.

5

The waste material is still in the form of a slurry but a slurry from which the larger solid matter has been removed.

10

The waste material in the slurry form should have a water content of at least 30% so that it is easily workable and it is now loaded into slurry tankers for removal to the beds or passed along pipeline whether permanent or temporary to the beds.

15

The beds are filled with the slurry or liquid waste material to a depth of around 0.1m.

20

The slurry in the individual beds is now allowed to dry with the water being removed by seepage into the ground and natural evaporation. Once the slurry has sufficiently dried the soil is spiked to a depth of 0.3m to break up the surface for example using a bulldozer ripping gear, and samples taken to determine whether anything further needs to be added to the land in preparation for growing of crops.

25

For example if trees are to be planted in order to provide a good growing base it is advised that a mulch be added say to a depth of 75mm.

Once any materials which need to be added have been the soil, the waste material and any further additives are mixed together by ploughing or rotavating to a depth of 0.4m. Once this has been completed the land is ready for planting.

5

The walls constructed to form the beds now have a secondary use and that is to provide a windbreak for any young crop, for example young trees.

10

The above methods have been described with regard to the treatment of liquid waste materials which can be readily returned to the land. However it is to be appreciated that this will not always be the case and in those circumstances methods in accordance with the present invention may still be utilised with the understanding that in this case the waste material is not immediately, if ever, ready for return to the land. It is therefore recommended that where the waste material extracted is of what could be said to be dubious nature it is initially stored in permanent beds such as concrete beds purpose built to hold such materials. From these beds the waste material can be treated to remove the risk to the environment and if appropriate returned to the land.

15

20

CLAIMS

1. A method of treating waste material which includes
preparing means to hold liquid material;
5 filling the means to hold liquid material with liquid
or liquefied waste material or passing the liquid or
liquefied waste material therethrough;
separating the liquid waste material so that the solids
content thereof concentrates and a part of the liquid phase
10 settles to the top;
removing the separated liquid phase from the means to
hold liquid material but maintaining the liquid content
above 30%; and
returning the waste material to the land.

15 2. A method of treating waste material as claimed in claim
1, wherein the means to hold liquid material is or includes
a filter means.

20 3. A method of treating waste material as claimed in claim
2, wherein the filter means is a filter press.

4. A method of treating waste materials includes:
preparing means to hold liquid material;
25 filling the means to hold liquid material to a
predetermined depth with liquid or liquefied waste material;
allowing the liquid waste material to settle so that
the solid content thereof separates from the liquid phase;
removing the separated liquid phase from the means to

hold liquid material but maintaining the liquid content above 30%; and

returning the waste material to the land.

5 5. A method of treating waste material as claimed in any preceding claim, wherein the liquid phase of the waste material is, or is substantially, water.

6. A method of treating waste material as claimed in any
10 preceding claim, wherein the means to hold liquid material is a bed or trench which is prepared and into which the liquid or liquefied waste material is placed.

7. A method of treating waste material as claimed in any
15 preceding claim, wherein the means to hold liquid material is a trench and the removing of the liquid phase is achieved by natural seepage of the liquid phase from the trench and/or evaporation under the sun.

20 8. A method of treating waste material as claimed in any preceding claim, wherein the removing of the liquid phase may be pumped or otherwise mechanically removed.

9. A method of treating waste material as claimed in any one
25 of the preceding claims, wherein a plastic liner is provided to prevent or arrest any leakage, or to make a preferential path for such leakage to a desired area.

10. A method of treating waste material as claimed in claim

9, wherein the liner is a 1000th gauge polyethylene liner.

11. A method of treating waste material as claimed in any one of claims 3 to 5, wherein the means to hold liquid material is a bed and after the removing of the liquid phase and prior to the returning of the waste material to the land the method includes a further drying stage where the liquid content of the waste material is substantially removed and the waste material may be termed as dried.

12. A method of treating waste material as claimed in claim 11, wherein the sun in conjunction with the natural seepage into the surrounding land is used to remove the liquid phase of the waste material both in the removing of the liquid phase and the further drying stage.

13. A method of treating waste material as claimed in any one of the claims 3 to 5, wherein the means to hold the liquid material comprises a container or containers and the liquid waste material is held in this container or these containers.

14. A method of treating waste material as claimed in any preceding claim, wherein the waste material is still in the form of a fluid such as a liquid and it is returned to the land by spraying or spreading of the waste material over the land.

15. A method of treating waste material as claimed in any

preceding claim wherein the waste material is dried to a solid and then ground into a powder like material to be placed in storage for subsequent usage.

5 16. Apparatus for use in the treating of waste materials, which apparatus includes a liquid holding means having inlet flow means, outlet flow means, a divider to divide the liquid storage means into two sections but which allows flow of waste material between the two sections and means to
10 break up any solid matter in the waste material.

17. Apparatus as claimed in claim 16, wherein the divider is a plate which extends downwards so as to enable the flow of waste material at the bottom of the liquid holding means.

15 18. Apparatus as claimed in claim 17, wherein the divider acts to define a space through which the waste material must flow to get from the inlet side of the apparatus to the outlet side of the apparatus, and in this space is located
20 the means to break up any solid matter in the waste material.

19. Apparatus as claimed in any one of claims 16 to 19, wherein means to break up the solid matter is a flail type
25 device which rotates within the space and acts down on any solid matter in the waste material.

20. Apparatus as claimed in any one of claims 16 to 19, wherein the liquid holding means is a skip container which

is provided with inlet pipes and outlet pipes.

21. A method for the treatment of waste materials as substantially hereinbefore described.

5

22. Apparatus for use in the treating of waste material as substantially hereinbefore described with reference to Figure 1 of the drawings.

Amendments to the claims have been filed as follows

1. A method of treating waste material which includes
preparing means to hold liquid material which means has
5 inlet flow means, outlet flow means, a divider to divide the
means into two sections whilst allowing flow of waste
material between the two sections and means to break up any
solid matter in the waste material;
testing the waste material for quality and water
10 content;
passing the waste material to the means to hold liquid
material;
filling the means to hold liquid material with liquid
or liquefied waste material or passing the liquid or
15 liquefied waste material therethrough;
using the means to break up any solid matter in the
waste material;
separating the liquid waste material so that the solids
content thereof concentrates and a part of the liquid phase
20 settles to the top;
removing the separated liquid phase but maintaining the
liquid content above 30%; and
returning the waste material to the land.
- 25 2. A method of treating waste material as claimed in claim
1, wherein the divider extends downwards so as to enable
the flow of waste material at the bottom of the means to
hold liquid material between the two sections thereof.

3. A method of treating waste material as claimed in claim 1 or 2, wherein the means to hold liquid material is or includes a filter means.

5 4. A method of treating waste material as claimed in claim 3, wherein the filter means is a filter press.

5. A method of treating waste materials includes:

preparing means to hold liquid material which means has
10 inlet flow means, outlet flow means, a divider to divide the means into two sections whilst allowing flow of waste material between the two sections and means to break up any solid matter in the waste material;

testing the waste material for quality and water
15 content;

filling the means to hold liquid material to a
predetermined depth with liquid or liquefied waste material;

using the means to break up any solid matter in the
waste material;

20 allowing the liquid waste material to settle so that the solid content thereof separates from the liquid phase;

removing the separated liquid phase but maintaining the liquid content above 30%; and

returning the waste material to the land.

25

6. A method of treating waste material as claimed in claim 5, wherein the divider extends downwards so as to enable the flow of waste material at the bottom of the means to hold liquid material between the two sections thereof.

7. A method of treating waste material as claimed in any preceding claim, wherein the separating and/or settling of the liquid or liquefied waste material is carried out in a further means to hold liquid.

5

8. A method of treating waste material as claimed in any preceding claim, wherein the liquid phase of the waste material is, or is substantially, water.

10

9. A method of treating waste material as claimed in claim 7 or 8, wherein the further means to hold liquid material is a bed or trench which is prepared and into which the liquid or liquefied waste material is placed.

15

10. A method of treating waste material as claimed in claim 8, wherein the further means to hold liquid material is a trench and the removing of the liquid phase is achieved by natural seepage of the liquid phase from the trench and/or evaporation under the sun.

20

11. A method of treating waste material as claimed in any preceding claim, wherein the removing of the liquid phase may be pumped or otherwise mechanically removed.

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12. A method of treating waste material as claimed in any one of the preceding claims, wherein a plastic liner is provided to prevent or arrest any leakage, or to make a preferential path for such leakage to a desired area.

13. A method of treating waste material as claimed in claim 12, wherein the liner is a 1000th gauge polyethylene liner.

5 14. A method of treating waste material as claimed in claim 8, wherein the further means to hold liquid material is a bed and after the removing of the liquid phase and prior to the returning of the waste material to the land the method includes a further drying stage where the liquid content of the waste material is substantially removed and the waste
10 material may be termed as dried.

15 15. A method of treating waste material as claimed in claim 14, wherein the sun in conjunction with the natural seepage into the surrounding land is used to remove the liquid phase of the waste material both in the removing of the liquid
phase and the further drying stage.

20 16. A method of treating waste material as claimed in any one of the preceding claims, wherein the means to hold the liquid material comprises a container or containers and the liquid waste material is held in this container or these
containers.

25 17. A method of treating waste material as claimed in any preceding claim, wherein the waste material is still in the form of a fluid such as a liquid and it is returned to the land by spraying or spreading of the waste material over the
land.

18. A method of treating waste material as claimed in any preceding claim wherein the waste material is dried to a solid and then ground into a powder like material to be placed in storage for subsequent usage.

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19. A method of treating waste material as claimed in any one of the preceding claims, wherein the divider is a plate which extends downwards so as to enable the flow of waste material at the bottom of the liquid holding means.

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20. A method of treating waste material as claimed in any one of the preceding claims, wherein the divider acts to define a space through which the waste material must flow to get from the inlet side of the apparatus to the outlet side of the apparatus, and in this space is located the means to break up any solid matter in the waste material.

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21. A method of treating waste material as claimed in any one of the preceding claims, wherein means to break up the solid matter is a flail type device which rotates within the space and acts down on any solid matter in the waste material.

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22. A method of treating waste material as claimed in any one of the preceding claims, wherein the liquid holding means is a skip container which is provided with inlet pipes and outlet pipes.

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23. A method of treating waste material for use in the

treating of waste material as substantially hereinbefore described with reference to Figure 1 of the drawings.



Application No: GB 9717370.2
Claims searched: 1 - 15

Examiner: Dr Chris Moore
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Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): B1D DPDE, DPDF, DPFC, DPLB, DPLD, DPNA

Int Cl (Ed.6): B01D 21/02, 21/08; C02F 1/52, 11/00, 11/12, 11/16

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2049461A (PETERSON) pg 2 line 55-60, pg 4 line 65	1,5,13
X	GB 1462892A (BLAW) pg 3 lines 29-34, fig 1, bag 132	1,4,5,89,13,15
X	GB 1227413A (ALBERT) pg 2 lines 103-106, example 2, fig 1, filter 3, liq removal 9	1-10,13
X	EP 0195679A2 (BIRKETT) pg 2 line 6, fig 2, store 44, filter 60	1,2,4-7 13
X	WO 96/03855A1 (MAFF) figs 1 and 2, trench 7, example 1	1,2,4-8 11-14
X	US 4159248A (TAYLOR) col 9 lines 15-20, col 16 line 8	1-5, 8,13
X	US 3857788A (SMITH) col 1 line 42, fig 1, weir 18	1,4-6, 11,13, 15

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.